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World Data Center A for Rockets and Satellites
National Space Science Data Center
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G-idard Space Flight Center
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IMS/Satellite Situation Center Report

Predicted Orbit Plots for

IMP-H - 1976

REPORT NO. 3

DECEMBER 1975

WDC A/NSSDC

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National Space Science Data Center/
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I. INTRODUCTION

This report contains predicted orbit plots for the IMP-H satellite for the time period January-December 1976. This satellite has been identified as an important possible contributor to the International Magnetospheric Study (IMS) project. The predicted orbit plots are shown in three projections. The time period covered by each set of projections is 12 days 6 hours, corresponding approximately to the period of IMP-H. The three coordinate systems used are the Geocentric Solar Ecliptic system (GSE), the Geocentric Solar Magnetospheric system (GSM).

For the GSE system, the X-axis is along the Earth-Sun line toward the Sun, and the Z-axis is perpendicular to the ecliptic plane such that the Y-axis is toward dusk. The GSE projection at the top left of the set of three plots shows the satellite trajectory rotated into the X-Y plane in order to illustrate the relative positions of the satellite and the bow shock and magnetopause boundaries. Fairfield's model (1971) for the average position of these boundaries has been used. This model corresponds to a solar wind velocity of 420 km/sec. For positive X values, a spherical rotation of the satellite radius vector has been performed at constant ecliptic longitude. For negative X values, a cylindrical rotation of the Y and Z components of the radius vector has been performed at constant X.

For the GSM system, the X-axis is along the Earth-Sun line toward the Sun, and the X-Z plane contains the geomagnetic dipole such that the Z-axis is positive northward and the Y-axis is toward dusk. The GSM projection at the top right of the set of three plots shows the satellite trajectory projected onto the Y-Z plane in order to show the relative position of the satellite and the neutral sheet. A simple model for the neutral sheet is assumed: the sheet is hinged onto the geomagnetic equator at 10 Earth radii in the antisolar direction and lies in the GSM λ -Y plane. The neutral sheet positions are shown as horizontal lines corresponding to six equally spaced times of the first day covered by the plot. The extent of the horizontal lines in Y has no significance. The projected trajectories are shown as solid lines for X < -10 Earth radii and as dashed lines for X > -10 Earth radii. The dashed lines indicate that the satellite is not in the region of the neutral sheet regardless of Z values.

For the SM system, the Z-axis contains the north magnetic pole, and the Y-axis is perpendicular to the Earth-Sun line toward dusk. The satellite trajectory is shown at the bottom of the set of three plets as magnetic latitude and magnetic local time. These values of magnetic latitude and magnetic local time use SM latitude and longitude as a basis.

For each of the three projections, time ticks and codes are given on the satellite trajectories. The codes are interpreted in the table at the base of each plot. Time is given in the table as year/day/decimal hour. The total time covered by each plot is shown at the bottom of each table. An additional variable is given in the table for each time tick. For the GSM and SM projection this variable is the geocentric distance to the satellite in Earth radii, and for the GSE projection the variable is satellite ecliptic latitude in degrees.

For the orbit predictions shown in this report actual spacecraft elements for epoch April 1975 were used. The predicted elements for January 1, 1976, are shown in Table 1.

II. IMP-H ORBIT CHARACTERISTICS FOR 1976

The low inclination of the IMP-H satellite precludes encounters with the direct access (cusp) region, and thus the magnetic latitude/magnetic local time projections shown in this report are of limited value. However, IMP-H provides a number of useful bow shock, magnetopause, and neutral sheet encounters throughout 1976.

The characteristics of the bow shock and magnetopause encounters do not vary throughout the year. Twice per revolution the satellite encounters these boundaries at negative $X_{\rm GSE}$. One encounter per boundary occurs in the midnight/dusk quadrant and one in the midnight/dawn quadrant. The satellite spends approximately 15 percent of each revolution in the nightside magnetosheath and approximately 65 percent of each revolution in the interplanetary medium. However, it should be noted that the triaxial fluxgate magnetometer (see brief descriptions) on IMP-H is not functioning, and thus the satellite is not an ideal monitor of the interplanetary medium.

The most useful characteristic of the IMP-H orbit in 1976 is the neutral sheet encounters. These are summarized in Table 2. There are 14 encounters grouped into three periods. During each period the encounters occur on consecutive revolutions and progress from the dawn to dusk magnetotail. Note, in addition, that the altitudes of the encounters in each period occur at progressively more remote regions of the magnetotail.

III. SPACECRAFT AND EXPERIMENT STATUS

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Brief descriptions of the 13 IMP-H experiments are given in pages 5-15. A summary is shown in Table 3. All experiments, except the fluxgate magnetometer (principal investigator, N. F. Ness), are operating normally or partially. Four of the IMP-H experimenters appear in the IMS Directory No. 2. However, only two, F. L. Scarf and D. J. Williams, have identified the IMP-H experiments under their IMS Program Summary numbers.

IV. FUTURE OPERATIONS

The Satellite Situation Center (SSC) maintains orbit prediction plots on 16-mm microfilm for IMP-H of the type shown in this document for the time period January 1977 through December 1979. These plots may be obtained upon request.

V. SPACECRAFT/EXPERIMENT CHARACTERISTICS

SPACECRAFT COMMON NAME- IMP-H ALTERNATE NAMES- PL-713A. EXPLORER 47 IMP 7. 06197

NSSDC ID- 72-073A

LAST REPORTED STATE- LAUNCHED AND OPERATING NORMALLY AT THE STANDARD DATA ACQUISITION RATE SINCE 09/23/72.

LAUNCH DATE- 09/23/72 SPACECRAFT WEIGHT- 390. KG LAUNCH SITE- CAPE CANAVERAL, UNITED STATES LAUNCH VEHICLE- DELTA

SPONSORING COUNTRY/AGENCY
UNITED STATES NASA-OSS

INITIAL ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
URBIT PERIOD- 17365. MIN
PERIAPSIS- 201599. KM ALT

EPOCH DATE - 09/25/72
INCLINATION - 28.6 DEG
APOAPSIS - 235639. KM ALT

RECENT ORBIT PARAMETERS
ORBIT TYPE- GEOCENTRIC
ORBIT PERIOD- 17482. MIN
PERIAPSI 198878. KM ALT

EPOCH DATE - 07/13/74
INCLINATION - 9.215 DEG
APOAPSIS - 243626. KM ALT

SPACECRAFT PERSONNEL (PM=PROJECT MANAGER. PS=PROJECT SCIENTIST)
PM = M. DAVISNASA-GSFC

GREENBELT, MD

PS - J.H. KINGNASA-GSFC GREENBELT. MD

SPACECRAFT BRIEF DESCRIPTION

IMP-H CONTINUED THE STUDY BEGUN BY EARLIER IMP SPACECRAFT OF THE INTERPLANETARY AND MAGNETOTAIL REGIONS FROM A NEARLY CIRCULAR ORBIT. NEAR 37 EARTH RADII. THIS 16-SIDED DRUM-SHAPED SPACECRAFT WAS 157 CM HIGH AND 135 CM IN DIAM. IT WAS DESIGNED TO MEASURE ENERGETIC PARTICLES. PLASMA. AND ELECTRIC AND MAGNETIC FIELDS. THE SPIN AXIS WAS NORMAL TO THE ECLIPTIC PLANE. AND THE SPIN PERIOD WAS 1.3 SEC. THE SPACECRAFT WAS POWERED BY SOLAR CELLS AND A CHEMICAL BATTERY. SCIENTIFIC DATA WERE TELEMETERED TO EARTH AT 1600 BPS (WITH A SECONDARY 402-BPS RATE AVAILABLE).

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----- IMP-H. BAME -------

EXPERIMENT NAME- MEASUREMENT OF SOLAR PLASMA

NSSDC ID- 72-073A-10

LAST REPORTED STATE- LAUNCHED AND OPERATING NORMALLY AT THE STANDARD DATA ACQUISITION RATE SINCE 09/23/72. EXPERIMENT PERSONNEL (PI=PRINCIPAL INVESTIGATOR. TL=TEAM LEADER DI=OTHER INVESTIGATOR. TM=TEAM MEMBER)

PI - S.J. BAMELOS ALAMOS SCI LAB

LOS ALAMOS. NM

OI - J.R. ASBRIDGELOS ALAMOS SCI LAB LOS ALAMOS. NM

EXPERIMENT BRIEF DESCRIPTION

A HEMISPHERICAL ELECTROSTATIC ANALYZER FAS USED TO STUDY DIRECTIONAL INTENSITY OF POSITIVE IONS AND ELECTRONS IN THE SOLAR WIND. MAGNETOSHEATH. AND MAGNETOTAIL. IONS AS HEAVY AS DXYGEN WERE RESOLVED WHEN THE SOLAR WIND TEMPERATURE WAS LOW. ENERGY ANALYSIS WAS ACCOMPLISHED BY CHARGING THE PLATES TO KNOWN VOLTAGE LEVELS AND ALLOWING THEM TO DISCHARGE WITH KNOWN RC TIME CONSTANTS. IN THE SCLAR WIND, POSITIVE IONS FROM 200 EV TO 5 KEV (15 PERCENT SPACING. 3 PERCENT RESOLUTION) AND ELECTRONS FROM 5 EV TO 1 KEV (30 PERCENT SPACING. 15 PERCENT RESOLUTION) WERE STUDIED. IN THE MAGNETOSHEATH, POSITIVE IONS EV TO 5 KEV (15 PERCENT SPACING. 3 PERCENT FROM 200 RESOLUTION) AND FROM 200 EV TO 2 KEV (30 PERCENT SPACING. 15 PERCENT RESOLUTION) AND ELECTRONS FROM 5 EV TO 1 KEV (30 PERCENT SPACING. 15 PERCENT RESOLUTION) WERE STUDIED. IN THE MAGNETOTAIL. POSITIVE IONS FROM 200 EV TO 20 KEV (30 PERCENT SPACING. 15 PERCENT RESOLUTION) AND ELECTRONS FROM 5 EV TO 1 KEV (30 PERCENT SPACING. 15 PERCENT RESOLUTION) AND FROM 100 EV TO 20 KEV (15 PERCENT RESOLUTION) WERE STUDIED.

EXPERIMENT NAME- MEASUREMENT OF SOLAR PLASMA

NSSDC 1D- 72-073A-02

LAST REPORTED STATE- LAUNCHED AND OPERATING PARTIALLY AT THE STANDARD DATA ACQUISITION RATE SINCE 12/11/73. EXPERIMENT PERSUNNEL (PI=PRINCIPAL INVESTIGATOR. TL=TEAM LEADER OI=OTHER INVESTIGATOR. TM=TEAM MEMBER)

----- IMP-H. BRIDGE -----

CAMBRIDGE. MA

CAMBRIDGE. MA

OI - J.H. BINSACK MASS INST OF TECH

CAMBRIDGE. MA

CAMBRIDGE. MA

EXPERIMENT BRIEF DESCRIPTION

A MODULATED SPLIT-COLLECTOR FARADAY CUP WHICH WAS PERPENDICULAR TO THE SPACECRAFT SPIN AXIS WAS USED TO STUDY THE DIRECTIONAL INTENSITY OF POSITIVE IONS AND ELECTRONS IN THE SOLAR WIND. TRANSITION REGION. AND MAGNETOTALL. ELECTRONS WERE STUDIED IN EIGHT LOGARITHMICALLY EQUISPACED CHANNELS BETWEEN 17 EV AND 7 KEV. POSITIVE IONS WERE STUDIED IN EIGHT CHANNELS BETWEEN SO EV AND 7 KEV. A SPECTRUM WAS OBTAINED EVERY EIGHT SPACECRAFT REVOLUTIONS. ANGULAR INFORMATION WAS OBTAINED IN EITHER 15 EQUALLY SPACED INTERVALS DURING A 360-DEG REVOLUTION OF THE SATELLITE OR IN 15 ANGULAR SEGMENTS CENTERED MORE CLOSELY ABOUT THE SPACECRAFT SUN LINE.

EXPERIMENT NAME- STUDY OF COSMIC-RAY. SOLAR. AND MAGNETOSPHERIC ELECTRONS

NSSDC ID- 72-773A-13

LAST REPORTED STATE- LAUNCHED AND OPERATING NORMALLY
AT THE STANDARD DATA ACQUISITION RATE SINCE 10/13/72.

EXPERIMENT PERSONNEL (PI=PRINCIPAL INVESTIGATOR. TL=TEAM LEADER OI=OTHER INVESTIGATOR. TM=TEAM MEMBER)

EXPERIMENT BRIEF DESCRIPTION

THIS EXPERIMENT STUDIED GALACTIC AND SOLAR ELECTRONS AND POSITRONS IN THE KINETIC ENERGY RANGE 50 KEV TO 2 MEV. INFORMATION ON PROTONS BETWEEN 0.5 AND 4.0 MEV WAS ALSO OBTAINED. A COLLIMATED STILBENE CRYSTAL SCINTILLATOR LOOKING PERPENDICULAR TO THE SPACECRAFT SPIN AXIS SERVED AS THE PRINCIPAL DETECTOR. A SIMILAR, FULLY SHIELDED CRYSTAL SERVED TO DEVERMINE THE CONTRIBUTION TO THE PRINCIPAL DETECTOR COUNT RATE OF ELECTPONS AND PROTONS GENERATED WITHIN THE PRINCIPAL DETECTOR BY GAMMA RAYS AND NEUTRONS. RESPECTIVELY. A FULLY SHIELDED CSI CRYSTAL SERVED AS A GAMMA-RAY SPECTROMETER AND WAS USED IN COINCIDENCE WITH THE PRINCIPAL DETECTOR TO DISTINGUISH ELECTRONS FROM POSITRONS. COUNT RATES FROM EACH DETECTOR DBTAINED IN FIGHT ANGULAR SECTORS PER REVOLUTION WERE TELEMETERED. IN ADDITION. THE AMPLITUDE AND SHAPE OF THE PULSE GENERATED IN THE PRINCIPAL DETECTOR BY THE FIRST STOPPING PARTICLE IN EACH APPROPRIATE TELEMETRY FRAME WILL BE STUDIED. PULSE AMPLITUDE AND SHAPE WERE TO YIELD ENERGY (10 PERCENT RESULUTION) AND PARTICLE SPECIES INFORMATION.

----- IMP-H. FRANK ------

EXPERIMENT NAME - MEASUREMENT OF LOW-FRERGY PROTONS AND **ELECTRONS**

NSSDC 10- 72-073A-04

LAST REPORTED STATE- LAUNCHED AND OPERATING NORMALLY AT THE STANDARD DATA ACQUISITION RATE SINCE 09/23/72. EXPERIMENT PERSONNEL (PIEPRINCIPAL INVESTIGATOR. TLETEAM LEADER DI=OTHER INVESTIGATOR. TM=TEAM MEMBER)

IOWA CITY. IA

EXPERIMENT BRIEF DESCRIPTION

EXPERIMENT MEASURED THE ENERGY LOW-ENERGY ELECTRONS AND PROTONS IN THE GEOCENTRIC RANGE 30 TO 40 R(E) TO FURTHER UNDERSTAND GEOMAGNETIC STORMS. AURORA. TAIL AND NEUTRAL SHEET. AND OTHER MAGNETOSPHERIC PHENOMENA. THE DUAL-CHANNEL CURVED PLATE ELECTROSTATIC A DETECTOR WAS PROT ON AND - LOW-ENERGY (LEPEDÉA ANALYZER DIFFERENTIAL ANALYZER) WITH 16 ENERGY INTERVALS BETWEEN 5 EV AND 50 KEV. IT HAD AN ANGULAR FIELD OF VIEW OF 9 DEG X 25 DEG IN FOUR DIRECTIONS PERPENDICULAR TO THE SPACECRAFT SPIN AXIS. THE DETECTOR WAS OPERATED IN ONE OF TWO MUDES (1) ONE PROVIDING GOOD ANGULAR RESOLUTION (16 DIRECTIONS FOR EACH PARTICLE ENERGY BAND) ONCE EACH 272 SEC. AND (2) ONE PROVIDING GOOD TEMPORAL RESOLUTION IN WHICH THE ENTIRE ENERGY RANGE IN FOUR DIRECTIONS WAS MEASURED EVERY 68 SEC.

EXPERIMENT NAME- IONS AND ELECTRONS IN THE ENERGY RANGE 0.1 TO 2 MEV

NSSDC ID- 72-073A-03

LAST REPORTED STATE- LAUNCHED AND OPERATING PARTIALLY AT THE STANDARD DATA ACQUISITION RATE SINCE 11/25/72.

EXPERIMENT PERSONNEL (PI=PRINCIPAL INVESTIGATOR. TL=TEAM LEADER OI=OTHER INVESTIGATOR. TM=TEAM MEMBER)

GLOECKLER OF MARYLAND COLLEGE PARK. MD

OI - C.Y. FAN OF ARIZONA TUCSON. AZ

OI - D.K. HOVESTADTMPI GARCHING. FED REP OF GERMANY EXPERIMENT BRIEF DESCRIPTION

THIS EXPERIMENT WAS DES IGNED TO DETERMINE AND ENERGY SPECTRA OF LOW-ENERGY PARTICLES COMPOSITION ASSOCIATED WITH SOLAR ACTIVITY AND INTERPLANETARY PROCESSES. THE DETECTORS USED WERE (1) AN ELECTROSTATIC ANALYZER (TO SELECT PARTICLES OF THE DESIGNATED ENERGY PER CHARGE) CUMBINED WITH AN ARRAY OF WINDOWLESS SOI. ID-STATE DETECTORS (TO MEASURE ENERGY LOSS) AND SURROUNDED BY AN ANTICOINCIDENCE SHIELDING AND (2) A PARTICLE TELESCOPE CONSISTING OF A SILICON SURFACE BARRIER DETECTOR AND A FLAT TWO-CHAMBER PROPORTIONAL COUNTER ENCLOSED IN AN ANTICOINCIDENCE SCINTILLATOR CUP. THE EXPERIMENT MEASURED PARTICLE ENERGIES FROM 0.1- TO 2-MEY PER CHARGE IN 12 BANDS AND UNIQUELY IDENTIFIED POSITRONS AND ELECTRONS AS WELL AS NUCLEI WITH CHARGES OF 2 FROM 1 TO 8 (CHARGE GROUP RESOLUTION FOR Z BETWEEN 9 AND 28). 1000-CHANNEL PULSE HEIGHT ANALYZERS, ONE FOR EACH ELEMENT OF THE TELESCOPE. WERE INCLUDED IN THE EXPERIMENT PAYLOAD. THE TELESCOPE FAILED ON NOVEMBER 25. 1972. WHEN THE WINDOW ON THE PROPORTIONAL COUNTER WEAKENED AND BURST DUE TO EXPOSURE TO UV RADIATION.

----- IMP-H. KRIMIGIS -----

EXPERIMENT NAME- CHARGED PARTICLE MEASUREMENTS EXPERIMENT

NSSDC 1D- 72-073A-08

LAST REPORTED STATE- LAUNCHED AND OPERATING PARTIALLY
AT THE STANDARD DATA ACQUISITION RATE SINCE 12/11/73.

EXPERIMENT PERSONNEL (PI=PRINCIPAL INVESTIGATOR. TL=TEAM LEADER
OI=OTHER INVESTIGATOR. TM=TEAM MEMBER)

PI - S.M. KRIMIGISAPPLIED PHYSICS LAB

LAUREL. MD

OI - T.P. ARMSTRONG OF KANSAS

LAWRENCE. KS

OI - J.A. VAN ALLEN OF IOWA

IOWA CITY. IA

EXPERIMENT BRIEF DESCRIPTION

THREE SOLID-STATE DETECTORS IN AN ANTICUINCIDENCE PLASTIC SCINTILLATOR OBSERVED ELECTRONS BETWEEN 0.2 AND 2.5 MEV. PROTONS BETWEEN 0.3 AND 500 MEV. ALPHA PARTICLES BETWEEN 2.0 AND 200 MEV. HEAVY PARTICLES WITH ATOMIC NUMBERS RANGING FROM 2 TO 5 WITH ENERGIES GREATER THAN 8 MEV. HEAVY PARTICLES WITH 2 VALUES RANGING BETWEEN 6 AND 8 WITH ENERGIES GREATER THAN 32 MEV. AND INTEGRAL PROTONS AND ALPHAS OF ENERGIES GREATER THAN 50 MEV/NUCLEON. ALL WITH DYNAMIC RANGES UF 1 TO ONE MILLION (PER SQUARE CM-SEC-STER). FIVE THIN WINDOW GEIGER-MUELLER TUBES OBSERVED ELECTRONS OF ENERGY GREATER THAN

15 KEV. PROTONS OF ENERGY GREATER THAN 250 KEV. AND X HAYS WITH WAVELENGTHS BETWEEN 2 AND 10 A. ALL WITH A DYNAMIC RANGE OF 10 TO 100 MILLIUM (PER SQUARE CM-SEC-STER). PARTICLES AND X HAYS PRIMARILY OF SOLAR ORIGIN WERE STUDIED. BUT THE DYNAMIC RANGE AND RESOLUTION OF THE INSTRUMENT PERMITTED COSMIC RAYS AND MAGNETOTALL PARTICLES TO BE OBSERVED. DETECTOR E1 (4-16 A X-RAYS. PROTONS .GT. 250 KEV. ELECTRONS .GT. 15 KEV.) FAILED AT ABOUT 1230 GMT. DECEMBER 14. 1972. DETECTOR E2A (1.5-12 A X-RAYS. PROTONS .GT. 500 KEV. ELECTRONS .GT. 45 KEV.) FAILED ON JANUARY 13. 1973 AT ABOUT 1700 GMT. DETECTORS E2B AND E2C (PROTONS .GT. 500 KEV. ELECTRONS .GT. 45 KEV.) BEGAN DEGRADING IN MID-DECEMBER. 1972 AND WERE USELESS AFTER JANUARY. 1973.

----- IMP-H. MCDONALD -------

EXPERIMENT NAME - SULAR AND COSMIC-RAY PARTICLES

NSSDC ID- 72-073A-09

LAST REPORTED STATE- LAUNCHED AND OPERATING NORMALLY
AT THE STANDARD DATA ACQUISITION RATE SINCE 09/26/72.

EXPERIMENT PERSONNEL (PI=PRINCIPAL INVESTIGATOR, TL=TEAM LEADER
OI=OTHER INVESTIGATOR, TM=TEAM MEMBER)

PI - F.B. MCDONALDNASA-GSFC

GREENBELT. MD

OI - UNKNOWNNASA-JSC

HOUSTON. TX

OI - B.J. TEEGARDENNASA-GSFC GREENBELT. MD

EXPERIMENT BRIEF DESCRIPTION

THE GSFC COSMIC-RAY EXPERIMENT MEASURED FNERGY SPECTRA. COMPOSITION. AND ANGULAR DISTRIBUTION UF SOLAR AND GALACTIC ELECTRONS. PROTONS. AND HEAVIER NUCLEI UP TO Z = 30. THREE DISTINCT DETECTOR SYSTEMS WERE USED. THE FIRST SYSTEM CONSISTED OF A PAIR OF SOLID-STATE TELESCOPES WHICH NEASURED INTEGRAL FLUXES ABOVE 150. 350. AND 700 KEV AND OF PROTONS ABOVE 0.05. 0.15. 0.70. 1.0. 1.2. 2.0. 2.5. 5.0. 15. AND 25 MEY. EXCEPT FOR THE .05 MEY PROTON MODE, ALL COUNTING MODES HAD UNIQUE SPECIES IDENTIFICATION. THE SECOND DETECTOR SYSTEM WAS A SOLID-STATE DE/OX VS E TELESCOPE THAT LUOKED PERPENDICULAR TO THE SPIN AXIS. THIS TELESCOPE MEASURED NUCLEI FROM 1 TO 16 AMU WITH ENERGIES BETWEEN 4 AND 20 MEY/NUCLEON. COUNTS OF PARTICLES IN THE 0.5 TO 4 MEV/NUCLEON RANGE, WITH NO CHARGE RESOLUTION. WERE OBTAINED AS COUNTS IN THE DE/DX. BUT NOT IN THE E. SENSOR. THE THIRD DETECTOR SYSTEM WAS A THREE-ELEMENT CSI SCINTILLATOR TELESCOPE WHOSE AXIS MADE AN ANGLE OF 39 DEG WITH RESPECT TO THE SPIN AXIS. THE INSTRUMENT RESPONDED TO ELECTRONS BETWEEN 2 AND 12 MEV AND NUCLEI FROM 1

TO 30 AMU IN THE ENERGY RANGE 20 TO 500 MEV/NUCLEON. FOR PARTICLES BELOW 80 MEV. THIS INSTRUMENT ACTED AS A DE/DX DETECTOR. ABOVE 80 MEV. IT ACTED AS A BIDIRECTIONAL TRIPLE DE/DX DETECTOR. FLUX DIRECTIONALITY INFORMATION WAS OBTAINED BY DIVIDING CERTAIN PORTIONS OF THE DATA FROM EACH DETECTOR SYSTEM INTO EIGHT ANGULAR SECTORS.

----- IMP-H, NESS ------

EXPERIMENT NAME- MAGNETIC FIELDS EXPERIMENT

NSSDC ID- 72-073A-01

LAST REPORTED STATE- INOPERABLE SINCE 04/03/73.

EXPERIMENT PERSONNEL (PIEPRINCIPAL INVESTIGATOR. (LETS OF LOADER OFFOTHER INVESTIGATOR) THE SAM MERSER.

PI - N.F. NESSNASA-GSEL

GREENHAL ! MD

OI - C.S. SCEARCENASA-LSFC

GREENBELT. MD

OI - J.B. SEFKNASA-GSFC

GREENBELT. MD

EXPERIMENT BRIEF DESCRIPTION

THIS EXPERIMENT CONSISTED OF A BOOM-MOUNTED TRIAXIAL FLUXGATE MAGNETOMETER DESIGNED TO STUDY THE INTERPLANETARY AND GEOMAGNETIC TAIL MAGNETIC FIELDS. EACH SENSOR HAD THREE DYNAMIC RANGES -- PLUS OR MINUS 12. PLUS OR MINUS 30. AND PLUS OR MINUS 108 GAMMAS. WITH THE AID OF A BIT COMPACTION SCHEME (DELTA MODULATION). 25 VECTOR MEASUREMENTS WERE MADE AND TELEMETERED PER SEC. THE INSTRUMENT FUNCTIONED NORMALLY FROM TURN-ON (SEPTEMBER 23. 1972) TO DECEMBER 28. 1972. WHEN THE MECHANISM FAILED. THIS RENDERED SOMEWHAT MORE THE DETERMINATION OF ZERO LEVEL DRIFT IN THE FLIPPER MECHANISM DIFFICULT SPIN-AXIS SENSOR. THE INSTRUMENT CONTINUED IN THIS STATE UNTIL APRIL 4. 1973. WHEN INSTRUMENT MALFUNCTION CAUSED A SERIES OF SPACIGRAFT UNDER-VOLTAGE TURNOFFS. ATTEMPTS TO CORRECT THIS WERE UNSUCCESSFUL. AND THE INSTRUMENT WAS TURNED OFF ON APRIL 10. 1973.

EXPERIMENT NAME- SOLAR WIND ION COMPOSITION

NSSDC ID- 72-073A-12

LAST REPORTED STATE- LAUNCHED AND OPERATING NORMALLY
AT THE STANDARD DATA ACQUISITION RATE SINCE 09/24/72.

EXPERIMENT PERSONNEL (PISPRINCIPAL INVESTIGATOR, THETEAM LEADER
OISOTHER INVESTIGATOR, TM-TEAM MEMBER)

PI - K.W. OGILVIENASA-GSFC
GREENBELT. MD

EXPERIMENT BRIEF DESCRIPTION

AND WEIN-TYPE VELOCITY ANALYZER ELECTROSTATIC SELECTOR WERE USED TO GAIN EXPLORATORY DATA ON HEAVY ION COMPOSITION IN THE SOLAR WIND. THE BULK VELOCITIES OF 4HE+++ 4HE+. 3HE++. AND 0 (ISOTOPES INDISTINGUISHABLE) IONS IN ALL DURING 30 STATES WERE SEPARATELY STUDIED. NOITASINOI SUCCESSIVE SPACECRAFT SPIN PERIODS. IONS OF A GIVEN SPECIES WERE STUDIED IN 30 LOGARITHMICALLY EQUISPACED BULK VELOCITY CHANNELS FROM 200 TO 600 KM/SEC. A COMPLETE SET OF MEASUREMENTS REQUIRED ABOUT 10 MIN AND CONSISTED OF THIRTY 1-STEP SEQUENCES FOR 4 HE++ IONS AND FIVE 30-STEP SEQUENCES FOR EACH OF THE OTHER THREE SPECIES.

----- [MP-H. SCARF ------

EXPERIMENT NAME- PLASMA WAVE EXPERIMENT

NSSDC 1D- 72-073A-11

J.

LAST REPORTED STATE- LAUNCHED AND OPERATING NORMALLY

AT A SUBSTANDARD DATA ACQUISITION RATE SINCE 09/24/72.

EXPERIMENT PERSONNEL (PI=PRINCIPAL INVESTIGATOR. TL=TEAM LEADER

OI=OTHER INVESTIGATOR. TM=TEAM MEMBER)

PI - F.L. SCAPFTRW SYSTEMS GROUP REDONDO BEACH. CA

DI - G.M. CROOKGAINES M. CROOK ASSO

LAGUNA REACH, CA

OI - I.M. GREENTRW SYSTEMS GROUP REDONDO BEACH. CA

OI - R.W. FREDERICKSTRW SYSTEMS GROUP REDUNDO BEACH. CA

EXPERIMENT BRIEF DESCRIPTION

ELECTRIC FIELD COMPONENTS PERPENDICULAR SPACECRAFT SPIN AXIS AND THE MAGNETIC FIELD COMPONENT PARALLEL TO THAT AXIS WERE MEASURED BY AN ELECTRIC DIPOLE ANTENNA AND A SEARCH COIL MAGNETOMETER. BOTH SENSORS WERE MOUNTED ON A 3.05-M BODM. DATA WERE OBTAINED IN EIGHT FREQUENCY CHANNELS FROM 10 HZ TO 100 KHZ IN EITHER THE NORMAL MODE OR THE SNAPSHOT MODE. TWO CHANNELS. CENTERED AT 67 AND 600 HZ. HAD 10-DB FALL-OFF POINTS OF 17 AND 150 HZ. AND 270 AND 810 HZ. RESPECTIVELY. THE REMAINING SIX CHANNELS WERE NARROW-BANDWIDTH CHANNELS CENTERED AT 1.3. 2.3. 5.4. 10.5. 30. AND 70 KHZ. IN THE NORMAL MODE. THE ANTENNA WAS FIRST SAMPLED IN A GIVEN FREQUENCY CHANNEL MANY TIMES DURING A GIVEN MEASUREMENT PERIOD (COMPARABLE TO THE SPACECRAFT SPIN PERIOD). DURING THE NEXT PERIOD. THE SEARCH COIL WAS SAMPLED MANY TIMES IN THE SAME FREQUENCY CHANNEL. NEXT. THE ANTENNA WAS SAMPLED IN THE NEXT CHANNEL. FOLLOWED BY THE SEARCH COIL IN THAT FREQUENCY

CHANNEL. THE FREQUENCY CHANNELS WERE INCREMENTED. AND THE SAMPLED SENSORS WERE ALTERNATED UNTIL A FULL SET OF DATA WAS OBTAINED IN 16 MEASUREMENT PERIODS (APPROXIMATELY 20 SEC). IN THE SNAPSHOT MODE, ONLY ELECTRIC FIELD DATA WERE TRANSMITTED. AS FOLLOWS. THE ANTENNA WAS FIRST SAMPLED IN A GIVEN FREQUENCY CHANNEL MANY TIMES DURING A GIVEN MEASUREMENT PERIOD. IN THE NEXT PERIOD. THE ANTENNA WAS SAMPLED IN TWO SEQUENCES OF EIGHT FREQUENCY CHANNELS. THIS TWO-PERIOD MEASUREMENT WAS EXECUTED EIGHT TIMES. EACH TIME INCREMENTING THE FREQUENCY CHANNEL STUDIED IN EVERY OTHER PERIOD BY ONE. THUS. A FULL SET OF DATA AGAIN REQUIRED 16 MEASUREMENT PERIODS. IN ADDITION. AN ANALOG MODE. SAMPLING THE ANTENNA AND SEARCH COIL FROM 10 TO 100 HZ. WAS USED IN CONJUNCTION WITH THE SPECIAL PURPOSE ANALOG TEST TO BE CONDUCTED. UNFORTUNATELY THIS NEW TELEMETRY TELEMETRY SYSTEM DID NOT WORK WELL. AND NO USABLE DATA WERE DBTAINED IN THIS MODE OF OPERATION. FOR THE DIGITAL MODES, SOME INTERFERENCE WAS EXPERIENCED FROM THE ASYMMETRIC PLASMA SHEATH ASSOCIATED WITH THE POLAR CELL ARRAYS. THIS INTERFERENCE LIMITED THE SENSITIVITY OF THE MAGNETIC FIELD MEASUREMENTS AND INTRODUCED COMPLEXITY INTO ANALYSIS OF THE ELECTPIC FIELD MEASUREMENTS.

EXPERIMENT NAME- SOLAR FLARE HIGH-2/LOW-E AND LOW-Z ISOTOPE EXPERIMENT

NSSDC 1D- 72-073A-07

LAST REPORTED STATE- LAUNCHED AND OPERATING PARTIALLY

AT THE STANDARD DATA ACQUISITION RATE SINCE 12/03/74.

EXPERIMENT PERSONNEL (PI=PRINCIPAL INVESTIGATOR, TL=TEAM LEADER OI=OTHER INVESTIGATOR, TM=TEAM MEMBER)

PI - J.A. SIMPSON U DF CHICAGO CHICAGO IL

DI - M. GARCIA-MUNDZU OF CHICAGO CHICAGO. IL

EXPERIMENT BRIEF DESCRIPTION

THIS EXPERIMENT WAS TO INCREASE THE UNDERSTANDING OF SOLAR FLARE PARTICLE ACCELERATION AND PARTICLE CONTAINMENT IN MAGNETIC FIELDS IN THE VICINITY OF THE SUN. THE DETECTOR POINTED ALGNG THE SPACECRAFT SPIN AXIS. IT WAS A WINDOWLESS DE/DX VS E TELESCOPE WITH ANTICOINCIDENCE SHIELDING AND OPERATED IN EITHER OF TWO MODES -- (1) THE HIGH & - LOW E MODE HAVING AN ENERGY RANGE 0.5 TO 50 MEV/NUCLEON AND A CHARGE RANGE Z=5 TO 50 AND (2) THE LOW & MODE. HAVING AN ENERGY RANGE 6 TO 1200 MEV/NUCLEON (ISOTOPES - HYDROGEN. DEUTERIUM. TRITIUM, HELIUM-3. HELIUM-4). THE ENERGY RANGE FOR ELECTRONS WAS PRIMARILY 0.3 TO 10 MEV. THE ACCEPTANCE ANGLE OF THE DETECTOR WAS 50-DEG FULL ANGLE.

----- IMP-H. STONE ------

EXPERIMENT NAME - ELECTRONS AND HYDROGEN AND HELIUM ISOTOPES

NSSDC ID- 72-073A-06

LAST REPORTED STATE- LAUNCHED AND OPERATING NORMALLY

AT THE STANDARD DATA ACQUISITION RATE SINCE 09/23/72.

EXPERIMENT PERS()NNEL (PI=PRINCIPAL INVESTIGATOR, TL=TEAM LEADER OI=OTHER INVESTIGATOR, TM=TEAM MEMBER)

PI - E.C. STONECALIF INST OF TECH PASADENA. CA

DI - R.E. VOGTCALIF INST OF TECH

EXPERIMENT BRIEF DESCRIPTION

EXPERIMENT WAS DESIGNED TO MEASURE SOLAR AND GALACTIC ELECTRONS. POSITRONS. AND NUCLEI. AND TO SEPARATE ISOTOPES THROUGH OXYGEN. THE ENERGY RANGES COVERED WERE 0.16 TO 5 MEY (ELECTRONS). 0.16 TO 2 MEY (POSITRONS). AND ABOUT 1 40 MEV/N (NUCLEI). THE INSTRUMENT WAS A TELESCOPE CONSISTING OF 11 COLINEAR. FULLY DEPLETED. SILICON SURFACE INSIDE A PLASTIC SCINTILLATOR BARRIER DETECTORS ANTICOINCIDENCE SHIELD. FOUR OF THE TOP FIVE SENSORS WERE ANNULAR WHILE THE REMAINDER WERE SOLID DISCS. THIS ARRANGEMENT GAVE NARROW GEOMETRY (ANTICOLNCIDENCE IN ANNULAR SENSORS) AND WIDE GEOMETRY MODES WITH HALF ANGLE ACCEPTANCE CONES OF ABOUT 24 AND 36 DEG. THE TELESCOPE AXIS WAS PERPENDICULAR TO THE SPACECRAFT SPIN AXIS. DATA RETURNED CONSISTED OF 8-SECTORED AND SPIN-INTEGRATED COUNT RATES FOR EIGHT DIFFERENT COINCIDENCE/ ANTICOINCIDENCE MODES AND TWO PARAMETER PULSE HEIGHT ANALYSES FOR 32 PARTICLES EVERY 20.48 SEC. THE COINCIDENCE MODE CHOSEN FOR PULSE HEIGHT ANALYSIS IN ANY 0.64 SEC INTERVAL WAS FIXED BY A FIVE LEVEL PRIDRITY SYSTEM. THE PRINCIPAL CONTRIBUTORS TO EACH COINCIDENCE MODE RATE WERE -- (1) 0.16- TO S-MEY ELECTRONS AND 1- TO 43-MEY/N NUCLEI. (2) 1- TO 5-NEV ELECTRONS AND 13- TO 43-MEV/N NUCLEI. (3) NEUTRALS. SUCH AS GAMMA RAYS. (4) 0.2- TO 1-MEY ELECTRONS. (5) 1- TO 3-MEV ELECTRONS. (6) 1.2- TO 2.4-MEV/N NUCLEI. (7) 4- TO 13-MEV/N NUCLEI. AND (8) ELECTRONS ABOVE 3 MEV AND INITIAL EXPERIMENT PERFORMANCE WAS NUCLEI ABOVE 30 MEV/N. NORMAL.

EXPERIMENT NAME- ENERGETIC ELECTRONS AND PROTONS

NSSDC ID- 72-073A-05

LAST REPORTED STATE- LAUNCHED AND OPERATING NORMALLY AT THE STANDARD DATA ACQUISITION RATE SINCE 09/26/72. EXPERIMENT PERSONNEL (PI=PRINCIPAL INVESTIGATOR. TL=TEAM LEADER DI=OTHER INVESTIGATOR. TM=TEAM MEMBER)

WILLIAMSNOAA-ERL

BOULDER. CO

BOSTROMAPPLIED PHYSICS LAB C.O.

LAUREL. MD

ARMSTRONG (DECEASED) .. APPLIED PHYSICS LAB J.C.

LAUREL. MD

OI - J.H. TRAINORNASA-GSFC

GREENBELT. MD

EXPERIMENT BRIEF DESCRIPTION

THE PURPOSES OF THIS EXPERIMENT WERE (1) TO STUDY THE PROPAGATION CHARACTERISTICS OF SOLAR COSMIC RAYS THROUGH THE INTERPLANETARY MEDIUM OVER THE ENERGY RANGES INDICATED BELOW. (2) TO STUDY ELECTRON AND PROTON PATCHES THROUGHOUT THE GEDMAGNETIC TAIL AND NEAR AND THROUGH THE FLANKS OF THE MAGNETOPAUSE, AND (3) TO STUDY THE ENTRY OF SOLAR COSMIC RAYS INTO THE GEOMAGNETIC FIELD. THE INSTRUMENTATION CONSISTED OF A THR _E-ELEMENT TELESCOPE CONFIGURATION EMPLOYING SOLID-STATE DETECTORS AND A MAGNET TO DEFLECT ELECTRONS. TWO SIDE-MOUNTED DETECTORS WERE USED TO DETECT THE ELECTRONS DEFLECTED BY THE MAGNET. TWO ADDITIONAL SOLID-STATE DETECTORS WERE USED TO DETECT VERY LOW-ENERGY (GREATER THAN 15 KEV) PARTICLES, ALPHA PARTICLES. AND CHARGED PARTICLES OF Z GREATER THAN 2. THE EXPERIMENT WAS DESIGNED TO MEASURE (1) PROTON FLUXES FROM 30 KEY TO GREATER THAN 8.6 MEY IN SIX RANGES. (2) ELECTRON FLUXES FROM 30 KEV TO GREATER THAN 450 KEV IN THREE RANGES. (3) CHARGED PARTICLES GREATER THAN 15 KEV. (4) ALPHA PARTICLES GREATER THAN 0.5 MEV. GREATER THAN 1.6 MEV. 2.2 TO 8.8 MEV. AND 8-8 TO 35 MEV. AND (5) CHARGED PARTICLES OF Z GREATER THAN 2 AT E GREATER THAN 5 MEV.

REFERENCE

Fairfield, D. H., "Average and Unusual Locations of the Earth's Magnetopause and Bow Shock," <u>J. Geophys. Res., 76</u>, 28, 6700, October 1971.

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Table 1. ORBIT PARAMETER SUMMARY TABLE FOR IMP-H

	
Alternate Satellite Names	IMP 7 Explorer 47 PL-713A 06197
International ID	72-073A
Epoch (YY-MM-DD-HH-MM)	76-01-01-00-00
Period (min)	17596.73
Eccentricity	0.108
Inclination (deg)	24.64
R.A. of Ascending Node (deg)	69.67
Argument of Perigee (deg)	74.48
Mean Anomaly (deg)	300.17
Semimajor Axis (km)	224104.04
Perigee Height (km)	193481.16
Apogee Height (km)	241970.59
Local Time of Apogee (HH-MM)	14-05
Latitude of Perigee (deg)	23.67

Table 2. IMP-H NEUTRAL SHEET ENCOUNTERS FOR 1976

	Time (day/hr)	Y (Earth Fadii)	Geocentric Distance (Earth radii)
	1/24	-2	32.0
Period 1	13/24	+8	32.5
	26/4	+16	33.0
	141/3	-15	35.0
	153/8	-8	35.0
	165/18	-1	34.5
Period 2	177/24	+5	33.0
	189/24	+11	33.0
	202/5	+19	34.0
	306/5	-18	37.5
	318/8	-11	37.0
Period 3	330/12	-7	37.0
	342/22	-1	35.0
	355/1	-8	36.0

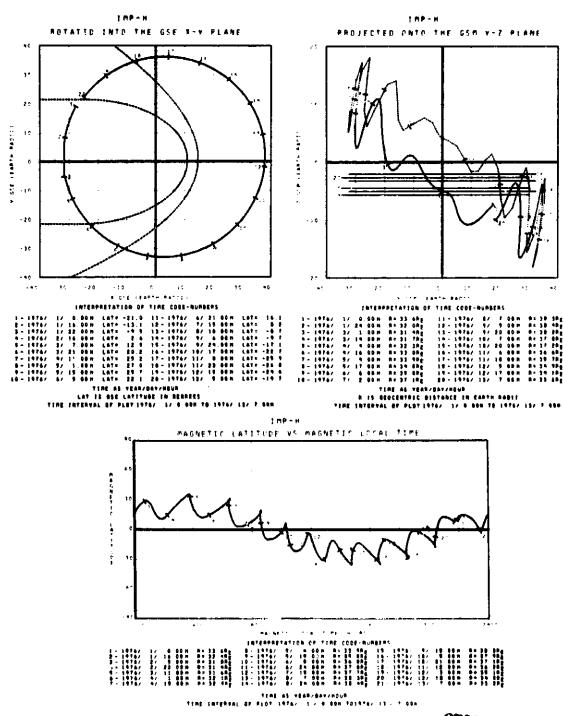
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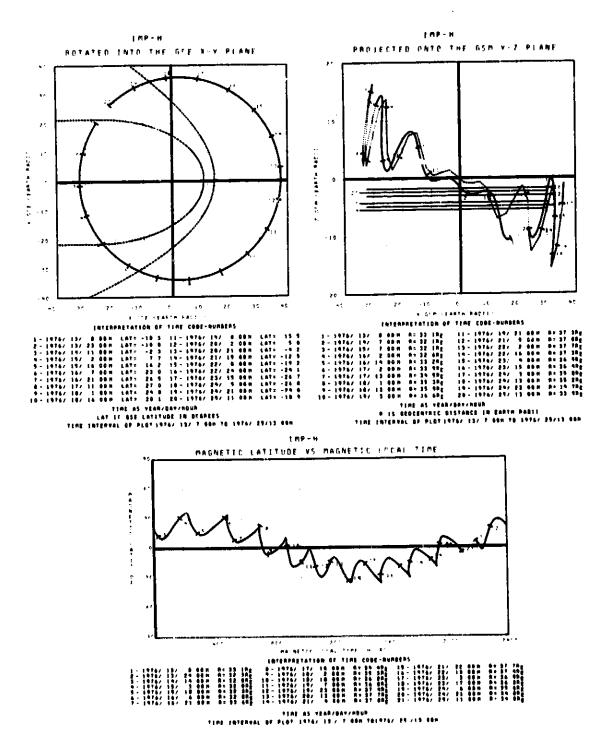
Table 3. IMP-H EXPERIMENT STATUS SUMMARY

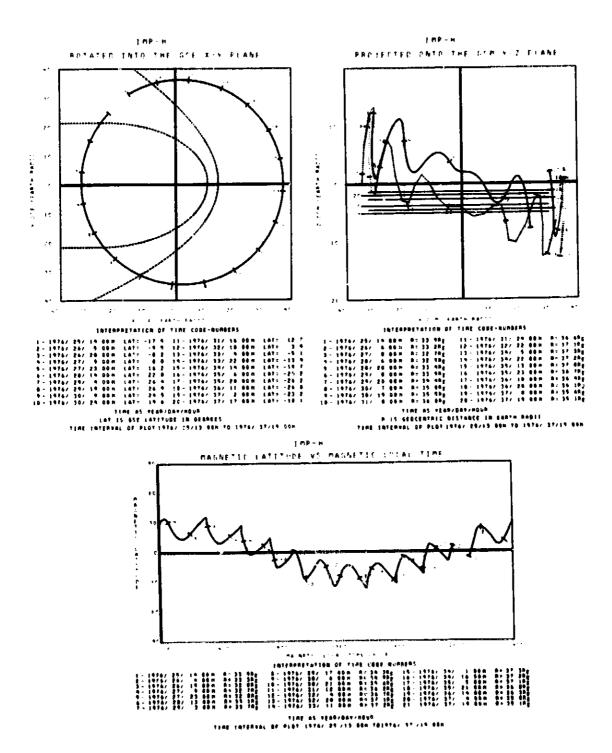
Experiment	Principal Investigator	Status	IMS Program Summary No.
Solar Plasma	S. J. Bame	Op	
Solar Plasma	H. S. Bridge	Par	
Cosmic Ray Electrons	T. L. Cline	Ор	
Low-Energy Electrons/Protons	L. A. Frank	Op	\$
Ions and Electrons	G. Gloeckler	Par	
Charged Particle	S. M. Krimigis	Par	
Solar/Cosmic Ray Particles	F. B. MacDonald	Op	
Magnetic Fields	N. F. Ness	Inop	0467*
Solar Wind Ion Composition	K. W. Ogilvie	Op	0260*
Plasma Wave	F. L. Scarf	Op	0290
Solar Flare Isotope	J. A. Simpson	Par	
Electrons/Hydrogen/Helium Isotope	E. C. Stone	Ор	
Energetic Electrons/Protons	D. J. Williams	Ор	0173

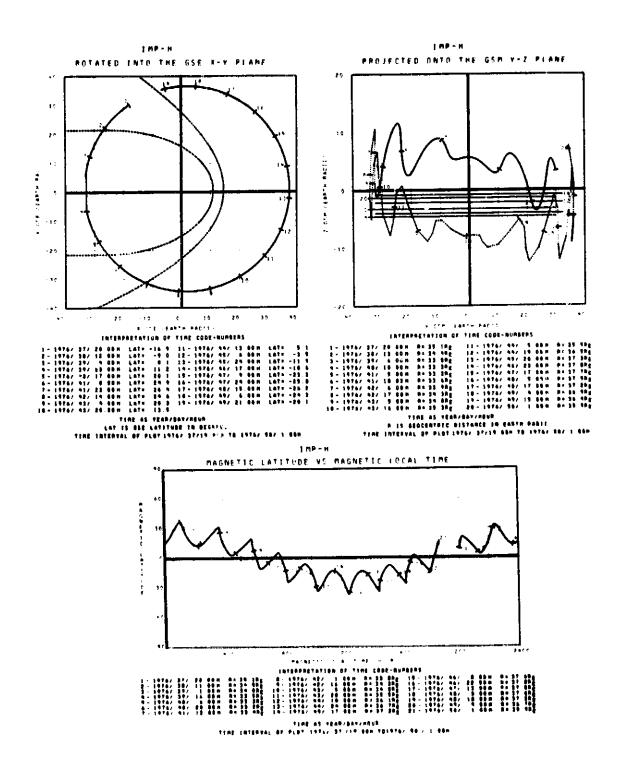
^{*} These experiments are not identified under these Program Summary numbers.

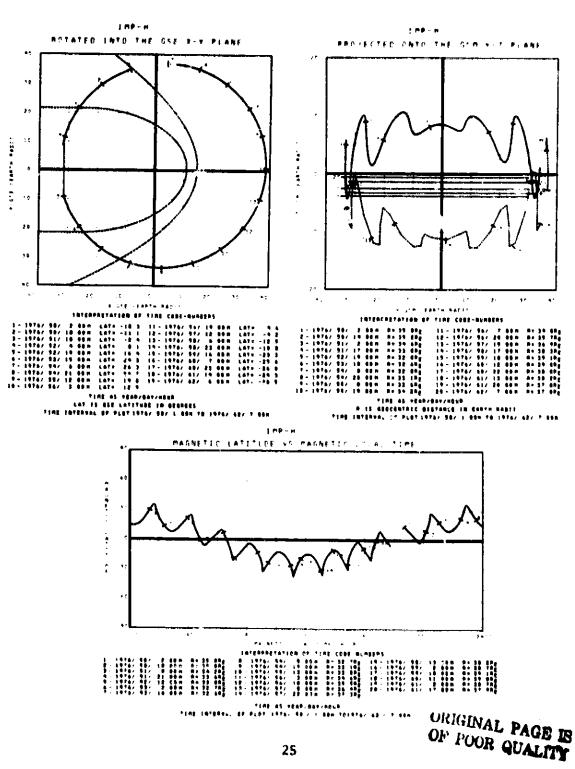
Op: Operating Normally
Par: Operating Partially
Inop: Inoperative

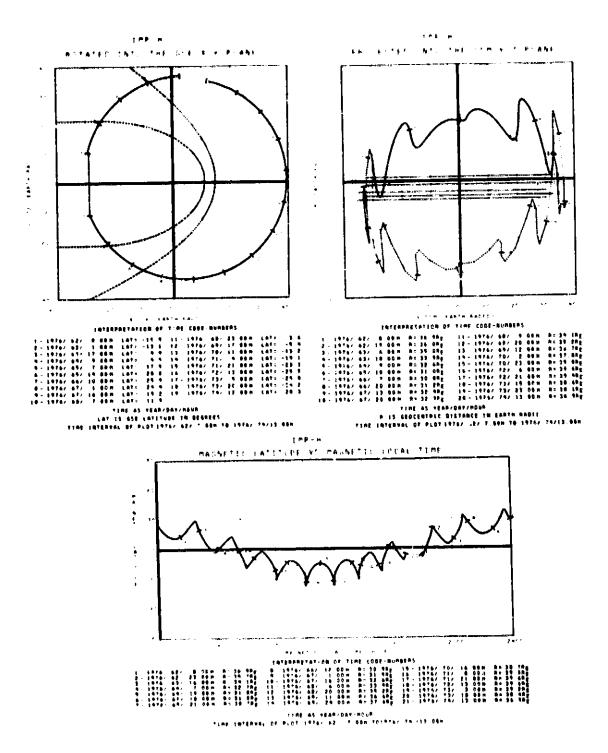


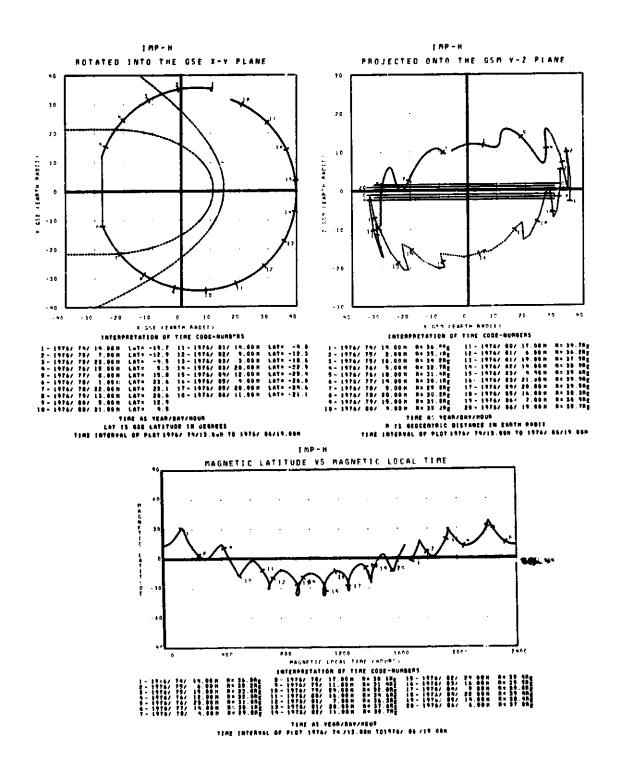


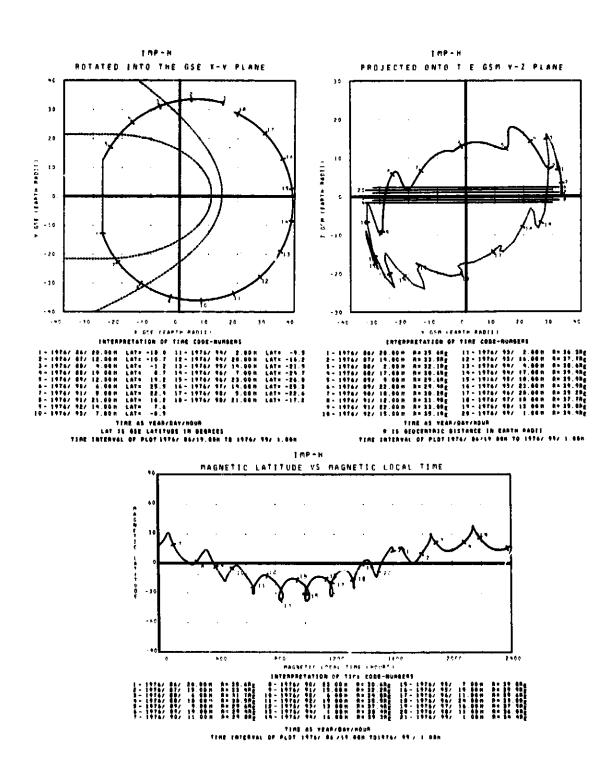




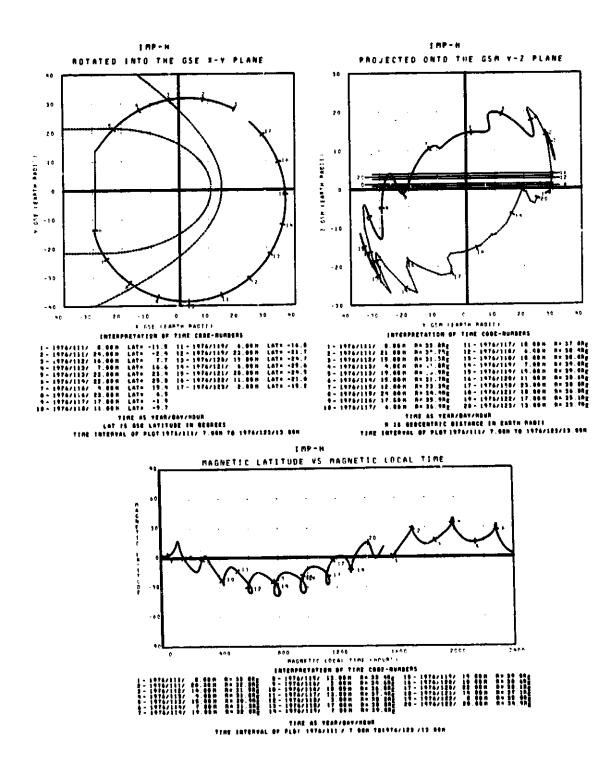


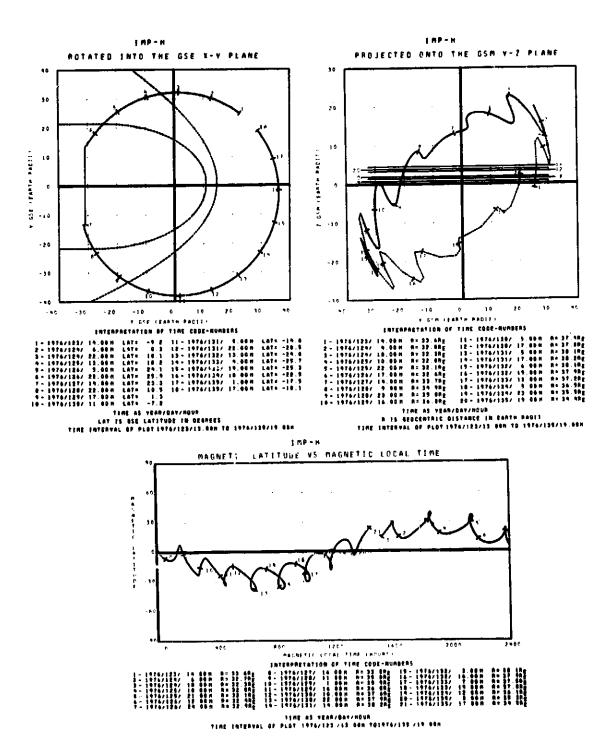


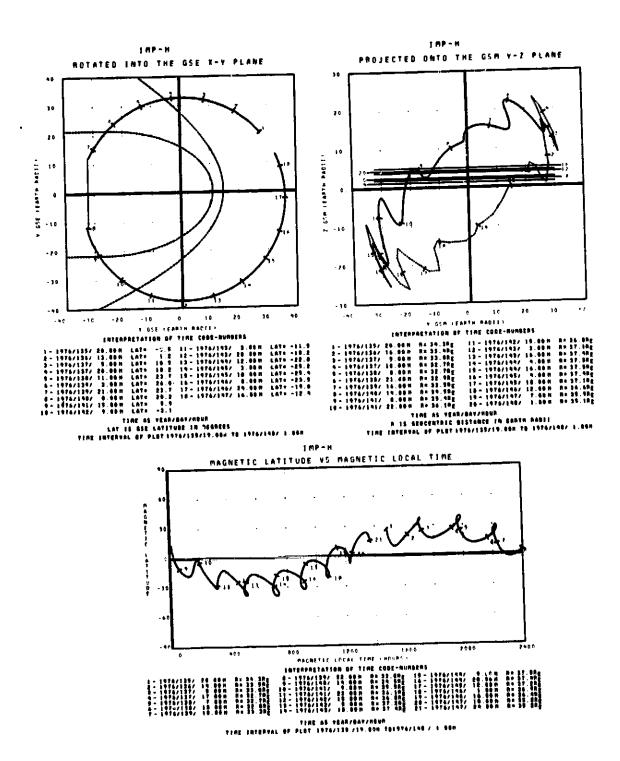




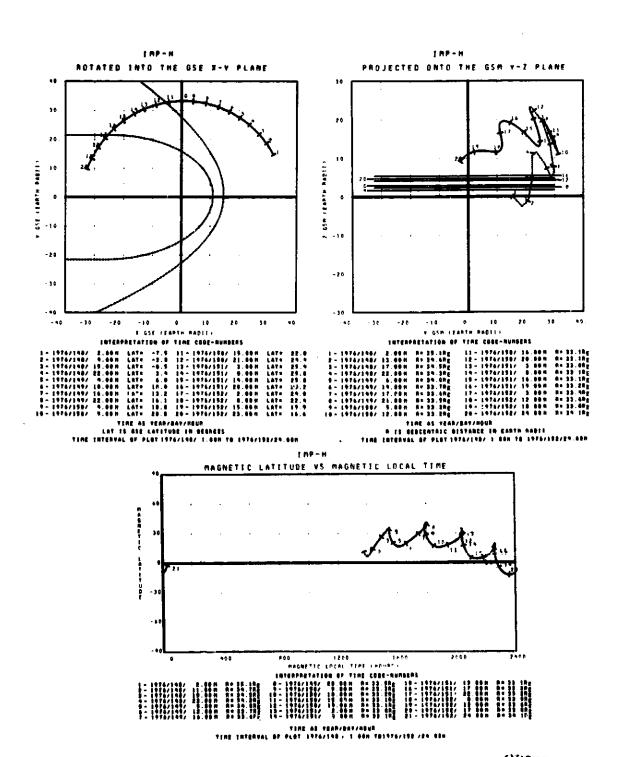
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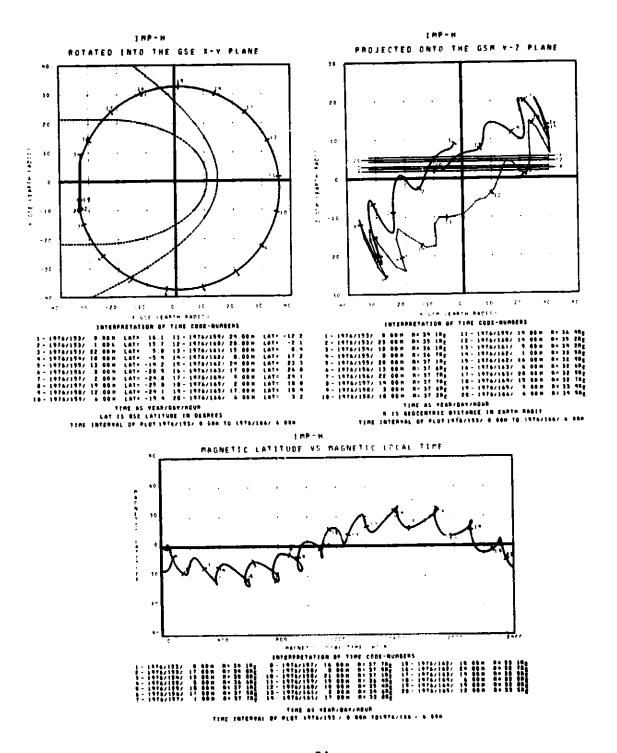


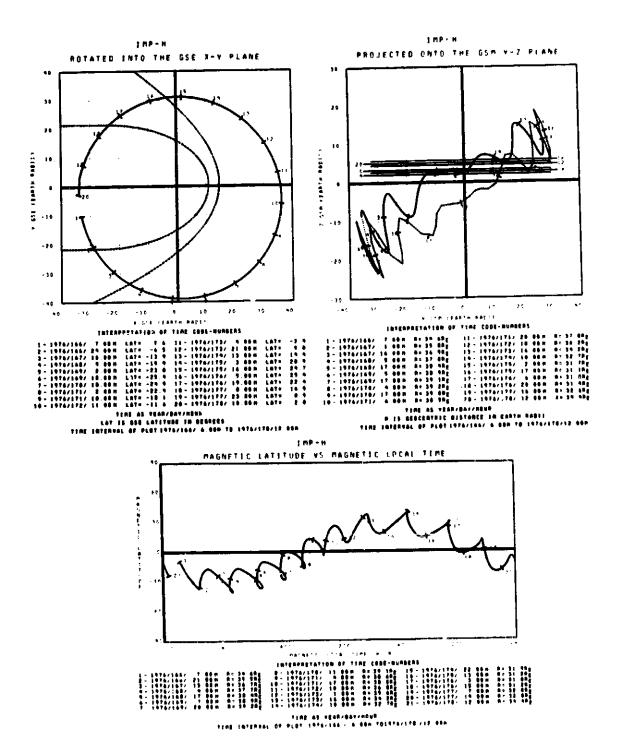


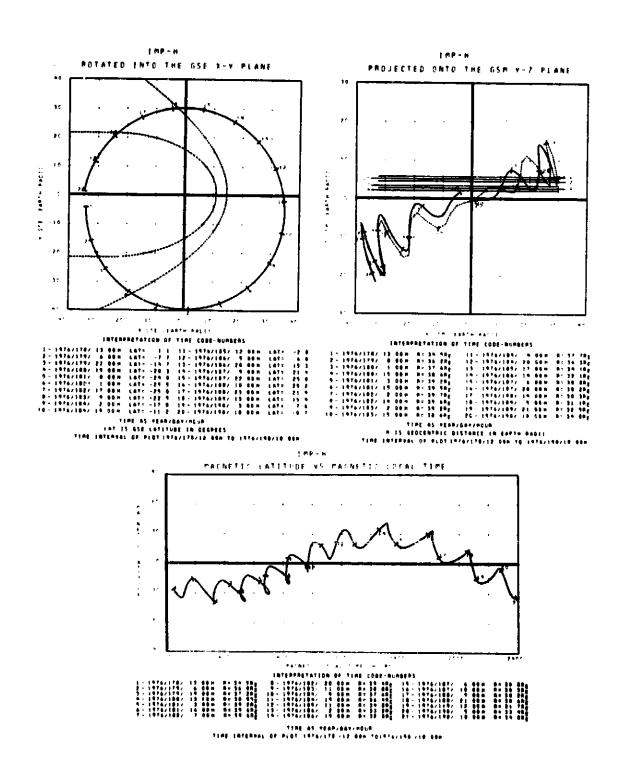


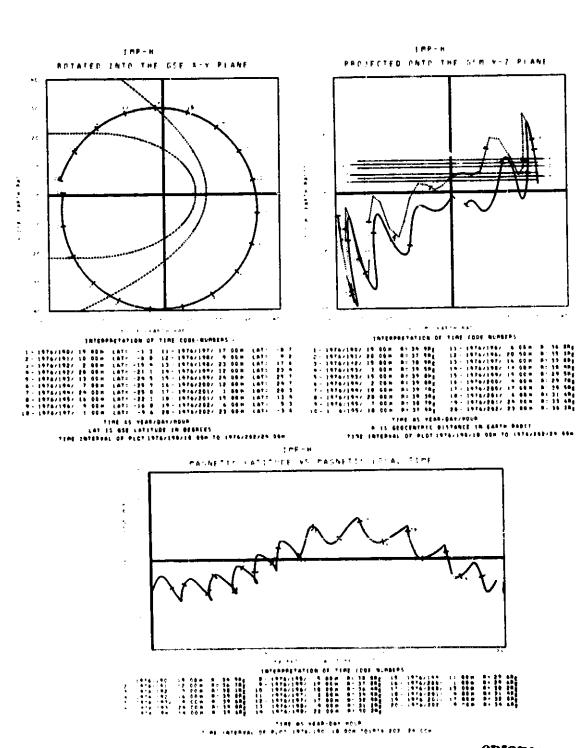
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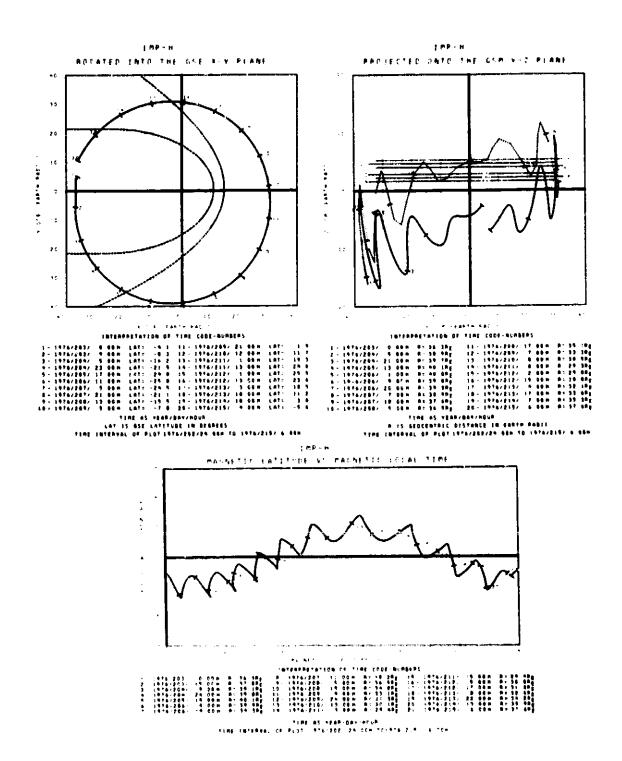


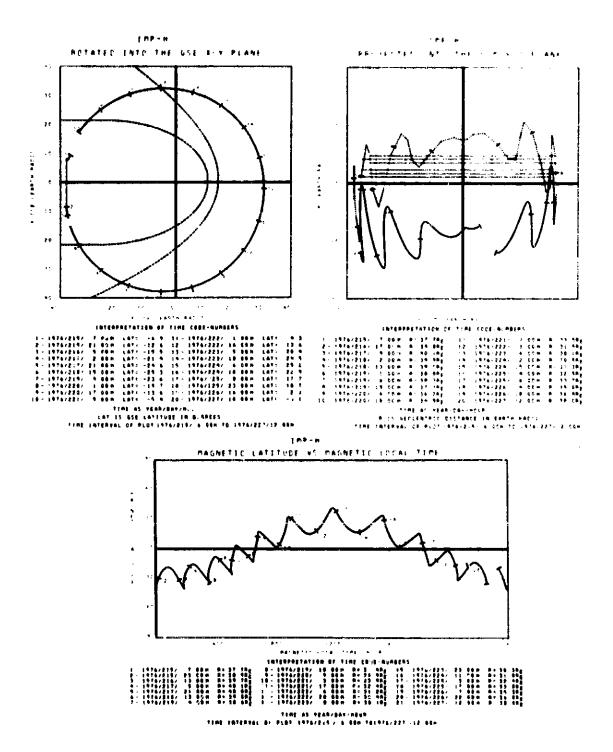


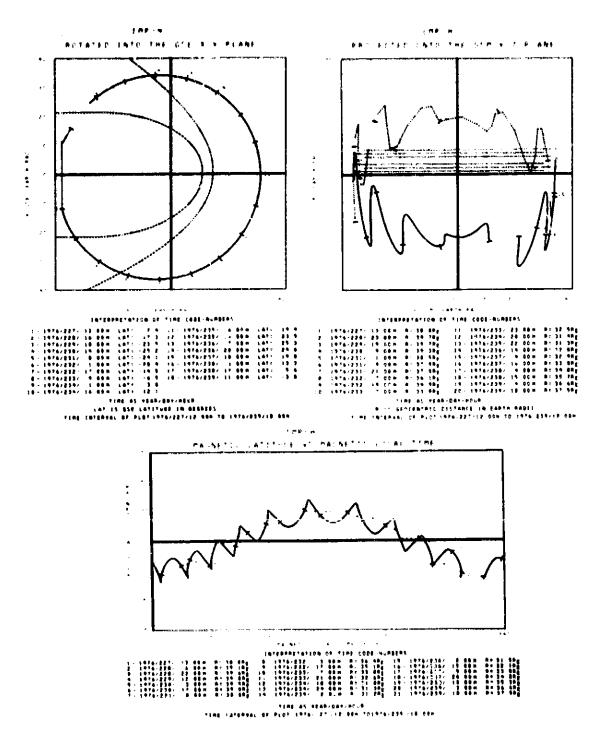


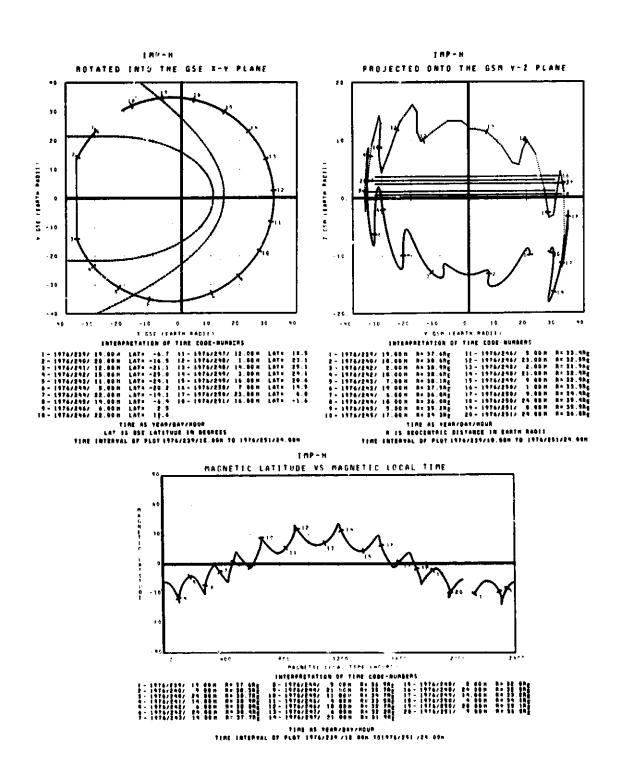


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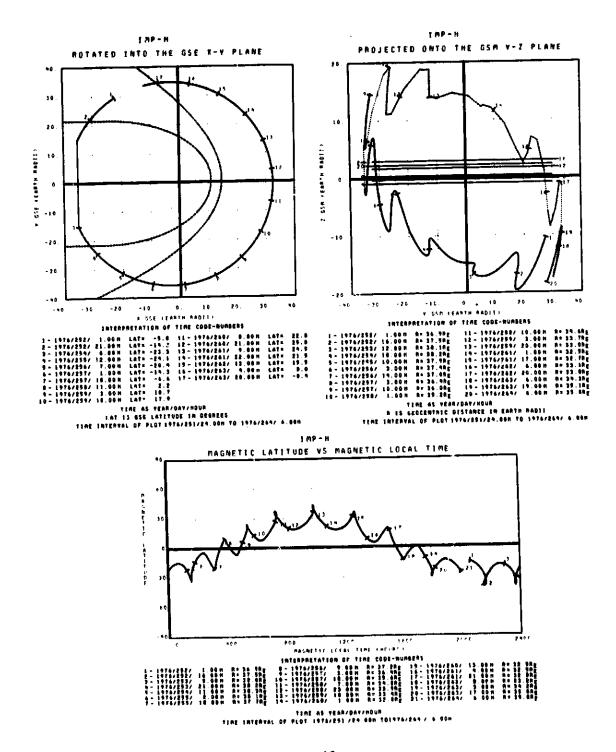




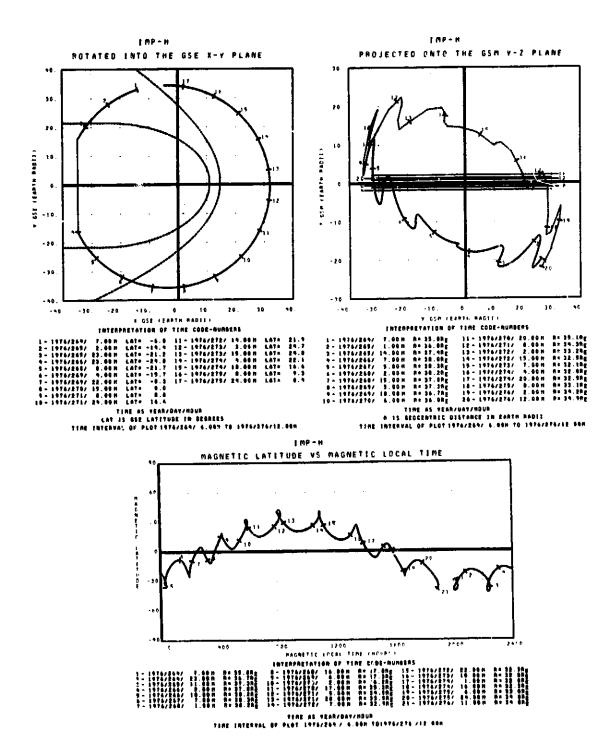


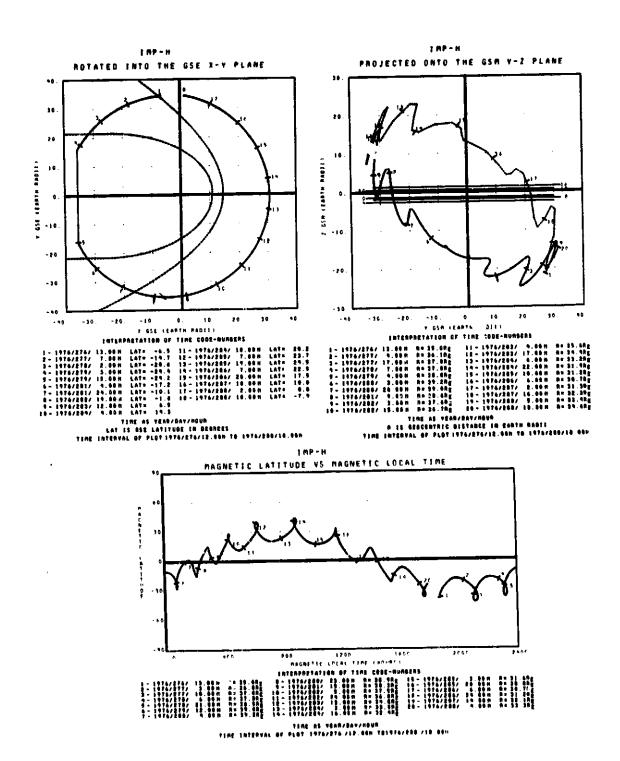


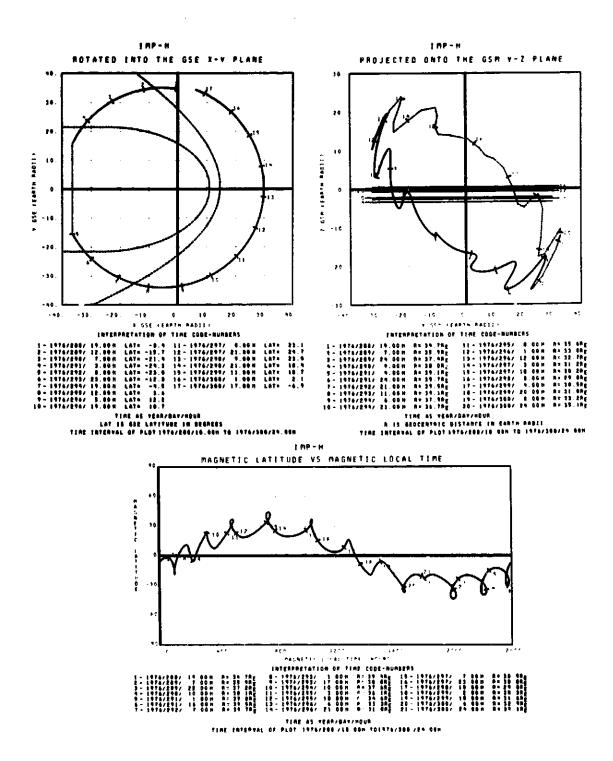
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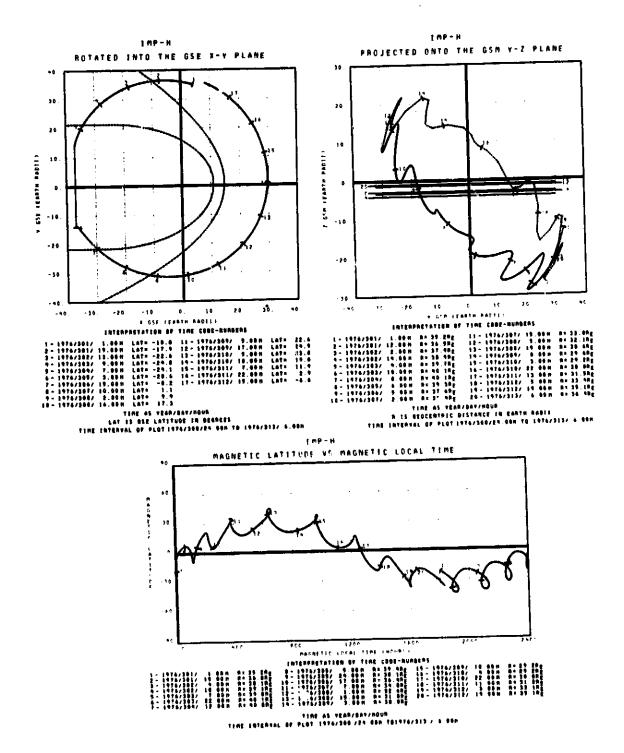
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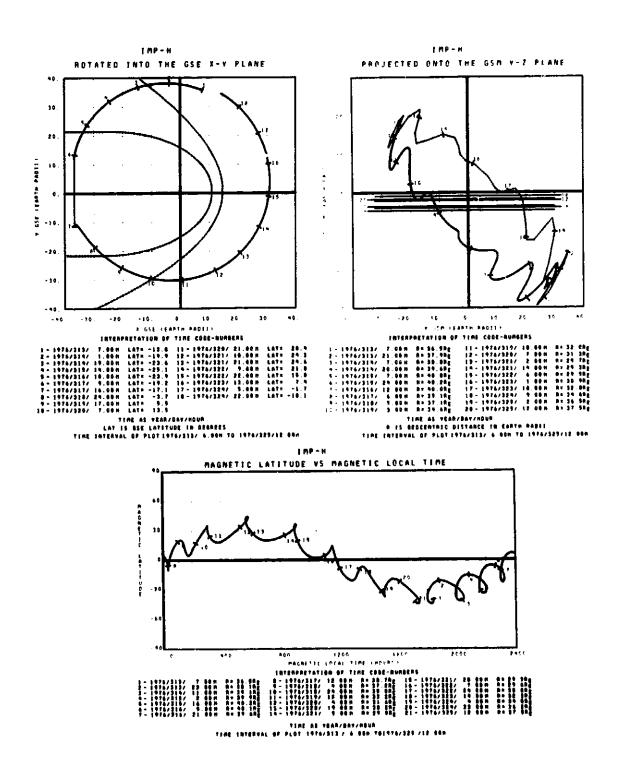


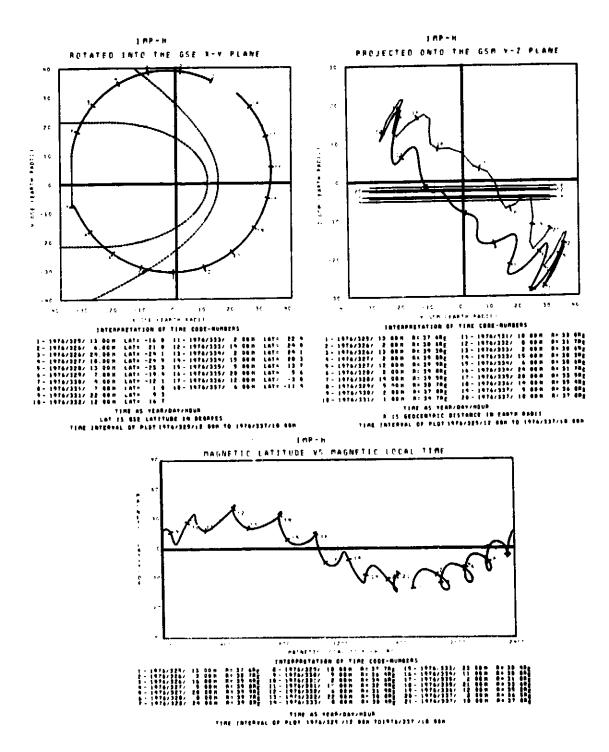


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